

CLAIMS

- 1 1. A primary alkaline battery, comprising:
2 a cathode comprising a cathode active material and carbon fibers;
3 an anode;
4 a separator; and
5 an alkaline electrolyte.
- 1 2. The battery of claim 1, wherein the cathode comprises less than about 5% of
2 carbon fibers by weight.
- 1 3. The battery of claim 1, wherein the cathode comprises less than about 4% of
2 carbon fibers by weight.
- 1 4. The battery of claim 1, wherein the cathode comprises less than about 3% of
2 carbon fibers by weight.
- 1 5. The battery of claim 1, wherein the cathode comprises less than about 2% of
2 carbon fibers by weight.
- 1 6. The battery of claim 1, wherein the cathode comprises between about 1% and
2 about 5% of carbon fibers by weight.
- 1 7. The battery of claim 1, wherein the cathode comprises between about 2% and
2 about 3% of carbon fibers by weight.
- 1 8. The battery of claim 1, wherein the cathode active material comprises
2 manganese dioxide.
- 1 9. The battery of claim 1, wherein the cathode comprises greater than about 86%
2 of cathode active material by weight.

1 10. The battery of claim 1, wherein the cathode comprises greater than about 88%
2 of cathode active material by weight.

1 11. The battery of claim 1, wherein the cathode comprises greater than about 90%
2 of cathode active material by weight.

1 12. The battery of claim 1, wherein the cathode comprises greater than about 92%
2 of cathode active material by weight.

1 13. The battery of claim 1, wherein the carbon fibers have a diameter less than
2 about 250 nanometers.

1 14. The battery of claim 1, wherein the carbon fibers have a diameter between about
2 60 nanometers and about 100 nanometers.

1 15. The battery of claim 1, wherein the carbon fibers have a diameter less than
2 about 60 nanometers.

1 16. The battery of claim 1, wherein the carbon fibers have been heat treated.

1 17. The battery of claim 16, wherein the carbon fibers have been heat treated at a
2 temperature greater than about 2000 °C.

1 18. The battery claim 16, wherein the carbon fibers have been heated treated at a
2 temperature between about 2600 °C and about 3100 °C.

1 19. The battery of claim 1, wherein the carbon fibers have a length less than about 2
2 x 10⁵ nanometers.

1 20. The battery of claim 1, wherein the carbon fibers have a length between about
2 500 nanometers and about 200,000 nanometers.

200 μm

1 21. The battery of claim 1, wherein the carbon fibers have a length between about
2 70,000 nanometers and about 100,000 nanometers.

1 22. The battery of claim 1, wherein the carbon fibers comprise between about 1 and
2 about 500 layers of graphite.

1 23. The battery of claim 22, wherein the carbon fibers comprise between about 40
2 and about 100 layers of graphite.

1 24. The battery of claim 1, wherein the carbon fibers have an external surface area
2 between about $10\text{m}^2/\text{g}$ and about $50\text{m}^2/\text{g}$.

1 25. The battery of claim 1, wherein the carbon fibers have a surface energy between
2 about $50\text{mJ}/\text{m}^2$ and about $300\text{mJ}/\text{m}^2$.

1 26. The battery of claim 1, wherein the carbon fibers have a graphitic index of less
2 than about 85%.

1 27. The battery of claim 1, wherein the carbon fibers have a length equal to or
2 greater than an average particle size of the cathode active material.

1 28. The battery of claim 1, wherein the cathode further comprises a surfactant.

1 29. The battery of claim 28, wherein the surfactant is selected from a group
2 consisting of polyvinyl alcohol, ethylene-vinyl alcohol, and polyvinylbutyrol.

1 30. The battery of claim 1, wherein the anode comprises zinc as an anode active
2 material.

1 31. A primary alkaline battery, comprising:
2 a cathode comprising manganese dioxide and a heat-treated carbon material having a
3 diameter less than about 250 nanometers;
4 an anode;

5 *add* a separator; and
6 an alkaline electrolyte.

1 32. The battery of claim 31, wherein the cathode comprises between about 1% and
2 about 5% of carbon fibers by weight.

1 33. The battery of claim 31, wherein the cathode comprises between about 2% and
2 about 3% of carbon fibers by weight.

1 34. The battery of claim 31, wherein the cathode has an electrical conductivity at
2 least 3 times greater than a cathode having about 6% of graphite.

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